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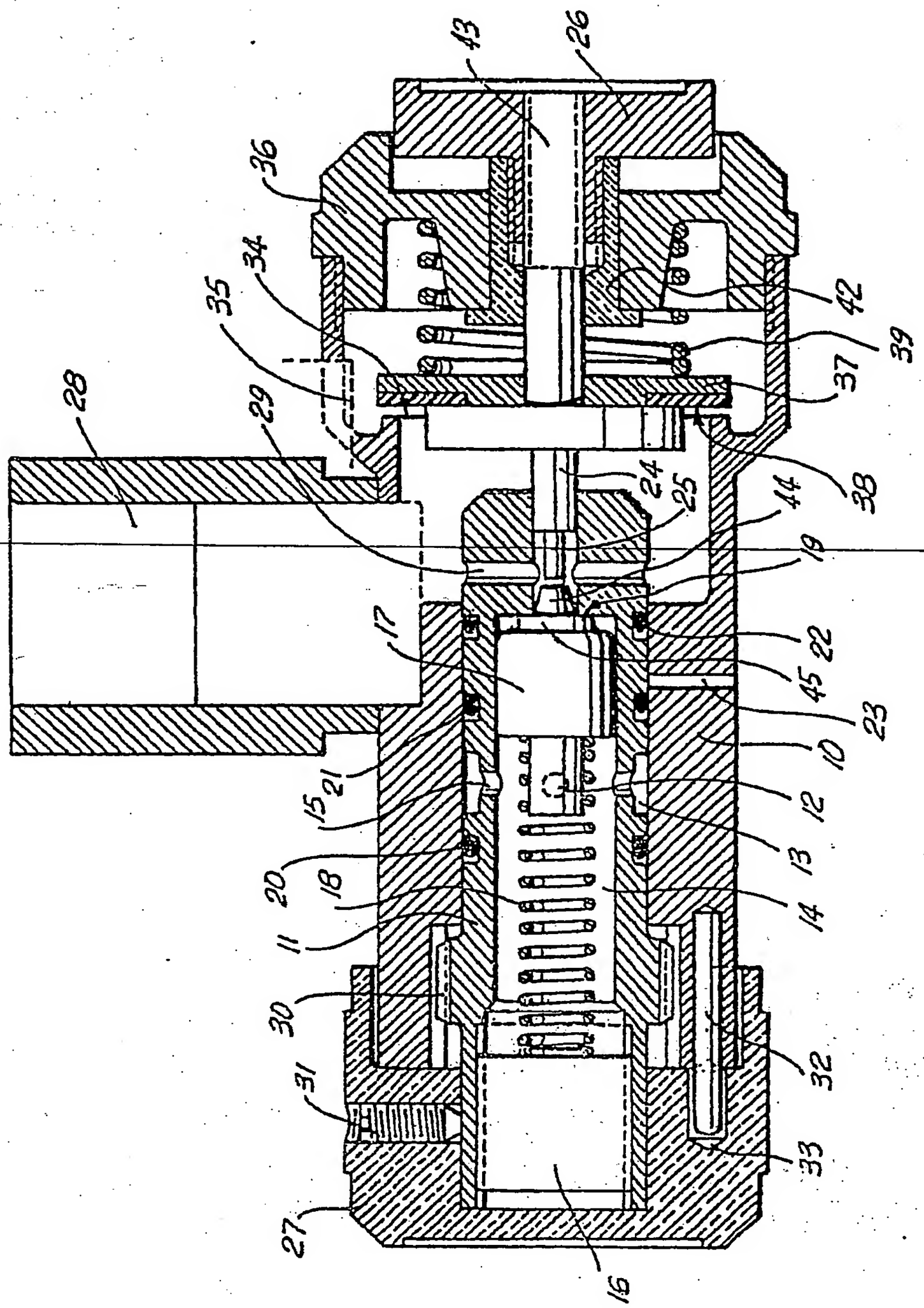
(54) Resuscitator valve assembly

(57) A resuscitator valve assembly has a manually operable self-closing main valve 17 and a spring loaded relief valve 37 to enable inhalable gas at a pressure less than that which would open the relief valve to be delivered to a patient to be resuscitated, wherein the main valve is carried by movable valve carrier 14 able to reside in either of two positions by turning selector 27, one in which the main valve and relief valve operate normally i.e. pressing knob 26 closes relief valve 37 and subsequently opens main valve 17 and another wherein both valves are held open.

GB 2 079 162 A



SPECIFICATION
Resuscitator valve

This invention relates to resuscitators for the treatment of people who have breathing difficulties or who are required to breathe gases other than air, for example, oxygen enriched air.

More particularly the invention relates to resuscitators which are adapted to perform a two fold function namely:

1. A resuscitator function which is required when the patient is incapable of breathing, and

2. An inhalation function, also known as therapy function, for the delivery to a patient of, for example, anaesthetic gases or enriched breathing gases, in cases when the patient requires such gases but is capable of breathing.

Portable resuscitators are well known for use in emergency situations and the invention is well adapted for application to portable resuscitators in that it provides for more or less fool-proof operation and the ready switching or conversion from the resuscitation function to the therapy function and vice versa. Furthermore according to the invention the resuscitator is adapted to provide various gas flow rates when operating in the therapy function mode to control the oxygen concentration delivered to the patient.

For preference, especially in respect of portable resuscitators, remote controls or flow indicating devices should be at a minimum. Furthermore, the resuscitator itself should have relief means to prevent over-pressurising the patient's lungs irrespective of the skill of the operator of the resuscitator.

With the foregoing in mind the present invention was developed to provide a resuscitator valve assembly which achieves the foregoing desiderata.

The invention achieves that object by providing a valve assembly wherein a single valve is utilised to control the flow of gas to the patient in both function modes, which valve is mounted within a movable valve carrier, the positional adjustment of which selects the therapy mode and determines the therapy flow of oxygen.

The invention also provides a valve assembly having an automatically operating pre-set pressure relief valve to prevent over pressurisation of the patient's lungs.

Furthermore, the pressure relief valve serves the additional function of closing off the normal vent to atmosphere when the resuscitator is in the resuscitation mode.

The invention consists in a resuscitator valve assembly comprising a hollow body, a valve carrier slidably movable within the body and having a hollow interior constituting a gas plenum chamber which moves with the valve carrier, inlet means to enable the feed of gas into the plenum chamber from an external source irrespective of the carrier position, a plunger operable, self-closing main valve carried by the valve carrier controlling the release of gas from said plenum chamber, outlet means for the conduction of gas released by the main valve to a patient irrespective of the carrier position, function selector means enabling positional adjustment of the carrier relative to the body, a manually operable self retracting plunger able to move coaxially of the body between predetermined limits, and a resiliently biased relief valve controlling gas flow from ambient air outside the body into and from said outlet means; the arrangement being such that for the resuscitation mode the depression of the plunger closes the relief valve and subsequently opens the main valve, and when the function selector means is set for therapy mode the position of the valve carrier is such that the main valve is held open by contact with the retracted plunger and the relief valve is also open.

By way of example, an embodiment of the above described invention is described below with reference to the accompanying drawing which is a sectional side elevation of a valve assembly in accordance with the invention.

The illustrated embodiment of the invention comprises a generally cylindrical body 10 housing an axially slidable valve carrier 11. The body 10 is adapted to receive regulated pressurised oxygen or respirable gas through a port 12 in the side of the body 10. The port preferably houses an inlet filter (not shown) and gas may flow through the port 12 into an annular space 13 defined by the body 10 and carrier 11.

The carrier 11 is hollow and defines a plenum chamber 14 fed from the annular space 13 through holes 15. The chamber 14 has one end blocked by plug 16.

Flow out of the other end of the chamber 14 is controlled by a main valve comprising a faceted valve element 17 with a tapered boss 44 projecting from it. The boss 44 is encircled by a soft annular seal 45. The element is biased by a loading spring 18 to bring the seal 45 against an annular seat 19. Annular sealing rings 20 and 21 prevent leakage of gas to the atmosphere from the space 13. Seal 22 and hole 23 provide a leakage path to atmosphere should there be a failure of seal 21.

Self-retracting plunger 24 has an extension 25 which is adapted to open the main valve by pressing against the boss 44 on element 17 to displace it and thus the seal 45 from the seat 19 against the effect of the spring 18. This may happen when either the plunger 24 is moved towards the element 16 by manual rotation of an adjustment knob 27, constituting the function selector means of the illustrated embodiment of the invention.

For the therapy function, knob 27 is rotated from OFF to the selected flow which will generally be a maximum of approximately 15 litres/min. This causes the valve carrier 11 to be traversed axially within body 10 causing boss 44 to contact extension 25 so that valve sealing member 45 is displaced from the valve seat 19. A graduated flow of gas is permitted to flow to the patient by the tapered outer surface of boss 44.

When the main valve is open gas flows from

the plenum chamber 14 into an outlet port 28 via holes 29. The outlet port 28 may be connected to a patient requiring pulmonary resuscitation by connecting a face mask or endotrachial tube to th port 28.

The axial movement of the valve carrier 11 is controlled by its threaded engagement at 30 with the housing 10. Calibration of this movement is achieved through the initial positioning of knob 27 relative to the carrier 11 and its securement thereto by way of a grub screw 31.

A pin 32 within the confines of an arcuate groove 33 serves to limit the rotational travel of knob 27, that is to form end stoop settings.

The left hand end of the body 10 (as seen in the figure) has a relief valve seat 34 formed in its bore and adjacent vent ports 35. This end of body 10 is shaped to form a housing for an assembly of components which act to provide control of exhalation, manual operation for resuscitation and a safety feature to prevent the development of high pressures which may harm the patient. This sub-assembly of components is removable to facilitate thorough cleaning by unscrewing cap 36 from the body 10.

The patient's exhalation is controlled through the axial movement of a relief valve element namely disc 37 which coacts with a relief valve seat 34. Disc 37 carries a soft surface material 38 to promote sealing. A spring 39 provides the closing force to maintain the seal.

During resuscitation, lung inflation is obtained by fully pressing button 26 which moves the plunger 24 to open the main valve.

The plunger 24 may move freely through the disc 37 but the spring 39 ensures that initially the disc moves with the plunger so that the exhalation flow path through the relief valve is occluded by contact of the soft seat 38 with the seat 34 before the element valve 16 is dislodged. This prevents wastage of fresh gas which is precious in the case of portable apparatus that has only a limited reserve supply.

The overpressure safety feature only operates when button 26 is depressed and relies on the fact that before damaging overpressure to the patient may occur, the disc 37 is moved off the seat 34 by the gas pressure against the effect of the spring 39 so as to vent the outlet port 28 through the ports 35. The spring 39 is chosen so that this happens when a predetermined maximum safe pressure is reached.

Button 26 is thread locked into a sleeve 42. Thread 43 provides an adjustment for the initial calibration of the valve to set the flow of gas when button 26 is fully released and the knob 27 is set for the therapy function.

CLAIMS

1. A resuscitator valve assembly comprising a hollow body, a valve carrier slidably movable within the body and having a hollow interior constituting a gas plenum chamber within the carrier which moves therewith, inlet means to enable the feed of gas into the plenum chamber from an external source irrespective of the carrier position, a plunger operable self-closing main valve carried by the valve carrier controlling the release of gas from said plenum chamber, outlet means for the conduction of gas released by the main valve to a patient irrespective of the carrier position, function selector means enabling positional adjustment of the carrier relative to the body, a manually operable self-retracting plunger able to move coaxially of the body between predetermined limits, and a resiliently biased relief valve controlling gas flow from ambient air outside the body into and from said outlet means;

the arrangement being such that for the resuscitation mode depression of the plunger closes the relief valve and subsequently opens the main valve and when the function selector means is set for therapy mode the position of the valve carrier is such that the main valve is held open by contact with the retracted plunger and the relief valve is also open.

2. A valve assembly according to claim 1 wherein said main valve comprises:

an annular sealing face encircling an outlet orifice from the plenum chamber,

a spring loaded valve element carrying an annular seal adapted to seat against said seating face, and a tapered boss on said element entering said outlet opening.

3. A valve assembly according to either of the preceding claims including limiting stop means for said function selector means.

4. A resuscitator valve assembly substantially as described herein with reference to the accompanying drawings.

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